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table of telegraphic instruments to which the lines of the different railroads are run, for the daily time-signals, and a chronograph properly mounted and connected with the two clocks and with all the telescopes belonging to the Observatory.

The west wing is the same size as the east one, and is used for the library and for the study of the Director and that of Dr. H. C. WILSON, his assistant. Shelves for books are arranged on three sides of the room, below which are three tiers of drawers, averaging ten inches deep and about two and a half feet in length. The library now contains 1300 volumes, with some reference books for each of the principal lines of study in mathematics and astronomy. In the north middle room is mounted, in the prime-vertical, a 3-inch FAUTH transit instrument. This instrument is to be used in latitude work for student exercise. In the small dome is placed the CLARK 8¼-inch equatorial telescope. This instrument is provided with an 8¼ photographic corrector and plate-holder, and the instrument does fine work in celestial photography for one of its size. It needs an enlarging eyepiece. The new FAUTH spectroscope adapted to it, which uses either a prism or a ROWLAND grating, greatly enlarges its facilities for instruction or original work.

In a few months the 16-inch equatorial by BRASHEAR and HASTINGS, with mounting by WARNER and SWASEY, will be completed. This instrument is to be provided with a fine, large universal spectroscope by Mr. BRASHEAR. The spectroscope will be provided with a photographic attachment as a means of recording spectra. The clock-work and chronograph attachment to this equatorial are to be the best of their kind. All instruments of the Observatory will be furnished with electric light, and the lecture-room is to be provided with a strong arc light for the study and illustration of various spectra.

A class of three post-graduate students is now in the first term of regular study and work in a course of three years of mathematics and astronomy.

CORRECTIONS TO WATSON'S THEORETICAL ASTRONOMY.

BY W. W. CAMPBELL.

I believe that no extensive list of corrections to WATSON'S "*Theoretical Astronomy*" has as yet been published. The following errata have been detected and are communicated to the Society with the hope that they will be useful to those of our members who possess this valuable book. The solutions of the examples in the second and subsequent chapters have not been systematically checked, and probably many of the numerical results are in error. Several of the numerical errata have been detected somewhat at random, and it must not be presumed that the parts of the computations which precede these errors are correct.

In the second column the + and — signs indicate that the numbers of the lines are to be counted from the top and bottom of the page respectively.

Page	Line	*For*	*Read*
22	+ 16	$\frac{m}{a^2}$	$-\frac{m}{a^2}$
22	— 6	$\frac{m_0}{a^2}$	$-\frac{m_0}{a^2}$
27	+ 7	$\frac{dx^2+dy^2+dz^2}{dt^2}$	$\frac{dx_{\prime}^2+dy_{\prime}^2+dz_{\prime}^2}{dt^2}$
28	— 8	the *areal velocity*	twice the *areal velocity*
29	+ 7	the sum	twice the sum
29	+ 13	" "	" " "
87	+ 11	never exceeds ± 0″.9	seldom exceeds ± 1″.0
93	— 6	never exceed ± 0″.9	seldom exceed ± 1″.0
97	+ 11	$\frac{1}{2}(\Omega-\omega_0)$	$\frac{1}{2}(\Omega'-\omega_0)$
125	+ 19	$\frac{1}{2}q^{\frac{3}{2}}\sec^4\frac{1}{2}v$	$\frac{1}{2}q^{\frac{3}{2}}\sec^4\frac{1}{2}v\,dv$
135	— 11	8.668959_n	8.668949_n
135	— 10	9.754919_n	9.754909_n
135	— 5	9.491991_n	9.491994_n
135	— 4	9.950466_n	9.950459_n
135	— 3	7.876553	7.876674
135	— 3	9.222898_n	9.222934_n
138	— 2	$\cdot\frac{dv}{dt}$	$\cdot\frac{dv}{dT}$
139	+ 10	9.242547	9.242559
140	+ 9	$\log\frac{dr}{dq}=0.186517_n$	$\log\frac{dr}{dq}=9.241469_n$
140	— 5	+ 0.70855	+ 0.70828
144	+ 6	$x+X_{\prime}$	$x-X_{\prime}$
144	+ 7	$y+Y_{\prime}$	$y-Y_{\prime}$
144	+ 8	$z+Z_{\prime}$	$z-Z_{\prime}$
147	+ 9	$\frac{\Delta}{r}$	$\frac{r}{\Delta}$

Page	Line	*For*	*Read*
158	+ 10	$\cos (N' + \beta)$	$\sin (N' + \beta)$
172	+ 18	Hence	And
172	− 7	ρ	ρ'
178	− 10	$\dfrac{r r'' \sin (v'' - v')}{r r' \sin (v' - v)}$	$\dfrac{r' r'' \sin (v'' - v')}{r r' \sin (v' - v)}$
191	+ 14	(47)	(49)
196	+ 8	$v + \omega''$	$v'' + \omega$
201	+ 3	$\sqrt{\kappa^2 - A^2}$	$\pm \sqrt{\kappa^2 - A^2}$
206	− 11	$\Delta \beta$	$\Delta \beta'$
239	+ 5	$R'R'' (\sin (\odot'' - \odot')$	$R'R'' \sin (\odot'' - \odot')$
253	− 10	x	x'
253	− 8	x	x'
254	+ 7	m and l	m' and j'
255	− 1	$(\sqrt{\sigma \sigma''})^3 \log_e \dfrac{\sigma''}{\sigma}$	$8 (\sqrt{\sigma \sigma''})^3 \log_e \dfrac{\sigma''}{\sigma}$
259	− 6	$\cos \phi$	$a \cos \phi$
261	+ 12	$v' = u - \omega$	$v' = u' - \omega$
265	+ 9	$-20''.8$	$-20''.2$
265	− 8	$347^\circ\ 0'.4$	$350^\circ\ 35'.1$
265	− 7	$+50^\circ\ 15'.8$	$+50\ 50'.8$
270	+ 20	10 21 34.19	10 21 34.60
271	− 5	x'	x
282	+ 5	$-x''$	$-y''$
286	+ 1	$x =$	$x' =$
288	− 7	$\dfrac{1}{1 + P}$	$\dfrac{1}{1 + P'}$
290	+ 4	$r' r''']$	$[r' r''']$
292	+ 1	ρ'	ρ
292	− 13	t'''	t''
292	− 10	b'''	b''
294	+ 13	$\sin \frac{1}{2} \gamma_0$	$\sin^2 \frac{1}{2} \gamma_0$
299	− 6	first and second	second and third
300	+ 16	$\tan u = \dfrac{\tan (l' - \Omega')}{\cos i}$	$\tan u' = \dfrac{\tan (l' - \Omega)}{\cos i}$
301	− 13	β''	β'''
313	− 15	$(98)_4$	$(48)_4$
315	+ 1	$\dfrac{d\delta}{d\Delta}$	$\dfrac{d\delta'}{d\Delta}$
315	+ 2	$\dfrac{d\delta}{d\Delta''}$	$\dfrac{d\delta'}{d\Delta''}$

Page	Line	*For*	*Read*
315	− 4	$(\lambda_2 - \lambda_1') \cos \beta_1'$	$(\lambda_2' - \lambda_1') \cos \beta_1'$
324	+ 17	$- \sin (\lambda - \odot) \cos \beta$	$\sin (\lambda - \odot) \cos \beta$
330	+ 12	$\cos (\alpha - A)$	$\sin (\alpha - A)$
337	− 13	$\frac{d\alpha}{dt}$	$\frac{d\alpha'}{dt}$
337	− 13	$\frac{\alpha'' - \alpha}{t' - t'}$	$\frac{\alpha'' - \alpha'}{t'' - t'}$
337	− 12	$\frac{d\alpha}{dt}$	$\frac{d\alpha'}{dt}$
337	− 11	$\frac{d^2\alpha}{dt^2}$	$\frac{d^2\alpha'}{dt^2}$
339	+ 18	$\frac{\Delta \varDelta}{d \varDelta}$	$\frac{\Delta \varDelta}{\delta \varDelta}$
340	− 1	$2 \sin \frac{1}{2} \epsilon \sin \frac{1}{2} \delta$	$2 a \sin \frac{1}{2} \epsilon \sin \frac{1}{2} \delta$
356	+ 15	only the right ascension for the middle place.	for the middle place only the right ascension
356	− 15	$+ n'' (\rho'' \sin \alpha''$ $- R'' \cos D'' \cos A'')$	$+ n'' (\rho'' \cos \alpha''$ $- R'' \cos D'' \cos A'')$
357	+ 2	only the right ascension for the middle place.	for the middle place only the right ascension
366	+ 5	$\frac{h}{\sqrt{\pi}} \int_{-\delta}^{+\delta} e^{-h^2 \Delta^2} d \varDelta$	$\frac{h}{\sqrt{\pi}} \int_{-\delta}^{+\delta} e^{-h^2 \Delta^2} d \varDelta$
382	+ 1	$[ee.2] - \frac{[cc.2]}{[cc.2]} [ce.2]$	$[ee.2] - \frac{[ce.2]}{[cc.2]} [ce.2]$
389	+ 6	$fn = -1$, and an, bn, cn,	$[fn] = -1$, and $[an]$, $[bn]$, $[cn]$,
389	− 10	en	$[en]$
392	+ 2	$[cf.2]$	$[df.2]$
394	+ 7	fn	$[fn]$
398	− 1	$[ee.5]$	$[ee.4]$
433	+ 5	$e x^4$	ϵx^4
434	+ 6	$\beta = - \frac{1}{2 \Delta x} (y_2 - y_1 + y_0)$	$\beta = \frac{1}{2 \Delta x} (4 y_1 - 3 y_0 - y_2)$
439	− 13	$\int_{a - i\omega}^{a + i\omega} f(x) \, dx$	$\int_{a - \frac{1}{2}}^{a + i\omega} f(x) \, dx$
441	+ 10	$- f'' (a - \omega)$	$- \frac{1}{2} f'' (a - \omega)$
441	+ 11	$- \frac{1}{2} f'' (a)$	$- \frac{1}{2} {}'' f (a)$
448	− 6	$(x' - x)^2 + (y' - y)^2$ $+ (z' - z)^2$	$(x' - x_0)^2 + (y' - y_0)^2$ $+ (z' - z_0)^2$

Page	Line	*For*	*Read*
449	+ 13	$\frac{1}{1047.819}$	$\frac{1}{1047.879}$
451	+ 6	$\frac{d^2\delta x}{dt^2}, \frac{d^2\delta y}{dt^2}, \frac{d^2\delta z}{dt^2}$	$\omega^2\frac{d^2\delta x}{dt^2}, \omega^2\frac{d^2\delta y}{dt^2}, \omega^2\frac{d^2\delta z}{dt^2}$
451	+ 14	" " "	" " "
455	− 14	t	t'
455	− 8	t	t'
455	− 4	$z_{\prime} = z$	$z_{\prime} = z''$
485	− 4	$x_{\prime}$	$z_{\prime}$
485	− 3	$y_{\prime}$	$z_{\prime}$
487	− 3	$y\, d\beta$	$y\, \delta\beta$
492	+ 13	$\frac{d\delta M}{dt^2}$	$\frac{d\delta M}{dt}$
495	+ 16	$(\sin \Omega - h)$	$\sin (\Omega - h)$
503	+ 15	$\frac{d^2\delta z_{\prime}}{dt}$	$\frac{d^2\delta z_{\prime}}{dt^2}$
504	− 5	δN	$\delta N'$
515	+ 6	(192)	(193)
518	− 10	$\frac{2}{r^2}\left[\frac{dr}{dt}\right]$	$-\frac{2}{r^2}\left[\frac{dr}{dt}\right]$
519	− 6	$2pr$	$2r\sqrt{p}$
549	+ 11	direct action of the sun to its disturbing action	disturbing action of the sun to its direct action
649	− 10	$-0''.00000272295\, t$	$-0''.00000272295\, t^2$

Page 36.—The author's statements concerning the permanency of geographical positions should be modified, in view of the results of recent investigations of the latitude problem.

[Note.—I would esteem it a very great favor if the readers of this book would inform me of any errata which have escaped my notice].

Ann Arbor, Mich., 1890, December.

THE FIREBALL IN RAPHAEL'S MADONNA DI FOLIGNO.

By Professor H. A. Newton.*

In a recent *Notice from the Lick Observatory*,† Director Holden called attention to the fireball which Raphael painted in his picture, the Madonna di Foligno. Any facts relating to such a representation in such a picture cannot fail to be of general interest.

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† Publications of the Astronomical Society of the Pacific, vol. ii, p. 19